The numerous types of meadows are treated in an interesting manner. Besides giving a complete description of each type with its various modifications, he contrasts meadows differing only in the direction of the slope, and others differing only in the character of the soil, thus showing the great ecological significance of these factors.

There are many commendable features about the work which will make it a suggestive model for future studies of similar small areas, not the least important of these being the lucid literary style.—G. H. SHULL.

NOTES FOR STUDENTS.

SHIBATA[1] proposes to designate as *amidases* certain enzymes found in the mycelium of *Aspergillus niger*, which spilt off ammonia from urea, biuret, and certain acid amides. They have nothing in common with the proteolytic enzymes. —C. R. B.

CHARLOTTE TERNETZ[2] finds in peat and peaty soils at least one fungus which is capable of fixing free N from the air. The fungus has a much branched septate mycelium and forms brown pycnidia which contain very small hyaline spores. It acts less energetically but more economically than *Clostridium Pasteurianum*.—C. R. B.

LIGNIER,[3] in an interesting comparison of the structures of Equisetales and Sphenophyllales, and of both with the structures of other pteridophytes, reaches the conclusion that these two groups, although differing in certain important particulars, really form one group, for which he proposes the name "Articulées." He further concludes that all the "Articulées" have a common ancestry, which was probably the most ancient Filicineae.—J. M. C.

LIGNIER[4] has discussed the nature of the so-called "flowers" of Gnetales in relation to similarly named structures in other gymnosperms and in angiosperms. He concludes that the staminate "flower" of Gnetales is a simple flower, and does not differ essentially from the much reduced flower of angiosperms; but that the ovulate "flower" is a very complex structure, really representing an inflorescence excessively reduced and condensed, and therefore could not be considered as a stage between the other gymnosperms and the angiosperms.—J. M. C.

IKENO, in reviewing and discussing the literature of the blepharoplast,[5]

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[1] SHIBATA, K., Über das Vorkommen von Amidespaltenden Enzymen bei Pilzen. Zeits. Ges. Biochemie **5**:384–394. 1904.

[2] TERNETZ, CHARLOTTE, Assimilation des atmosphärischen Stickstoffs durch ein torfbewohnenden Pilz. Ber. Deutsch. Bot. Gesells. **22**:267–274. 1904.

[3] LIGNIER, O., Equisétales et Sphénophyllales. Leur origine filicinéenne commune. Bull. Soc. Linn. Normandie V. **7**:93–137. 1903.

[4] LIGNIER, O., La fleur des Gnétacées est-elle intermédiaire entre celle des gymnospermes et celle des angiospermes? Bull. Soc. Linn. Normandie V. **7**:55–71. 1903.

[5] IKENO, S., Blepharoplasten im Pflanzenreich. Biol. Centrabl. **24**:211–221. *figs.* 3. 1904.

reasserts his previous view that the blepharoplast is a centrosome. He draws the following homologies between the structures concerned in plants (Characeae, Filicineae, and Equisetum) and animals (salamander and mouse): cilia are homologous with flagella; the thread from which the cilia are developed is homologous with the middle piece; and the deeply staining body in the plant spermatid (*Nebenkern* of Belajeff) is homologous with the deeply staining body (*Körperchen*) in the spermatid of animals.—CHARLES J. CHAMBERLAIN.

IN THE NUCLEI of the proembryo of *Ginkgo biloba*, according to ARNOLDI,[6] the chromatin is very inconspicuous, but increases in staining capacity and is easily seen during later stages in the development of the embryo. The staining reactions of the chromatin favor FISCHER'S theory that staining reactions are due to physical rather than to chemical causes. After the embryo has become somewhat elongated, it is differentiated into an upper haustorial region, a middle region, which is the suspensor, and an apical region which gives rise to the embryo proper.—CHARLES J. CHAMBERLAIN.

LAURENT[7] has published the results of a study of the Juncaceae, the first part dealing with the phenomena extending from the first appearance of the ovule to the formation of the testa, the second part describing the phenomena connected with seed germination. Various species of Juncus and Luzula were used. The facts of pollination and of fertilization are as usual; the undifferentiated embryos of certain species of Juncus are in contrast with the completely organized embryos of Luzula; the suspensor "contributes" to the formation of periblem and forms the root cap; the antipodal tissue, especially in Luzula, is noticeably active; and the structure of the testa forms the basis of a division of Luzula into two groups. —J. M. C.

SCHRÖDER CONTRIBUTES further data on the statocyst theory of geotropic perception.[8] He has investigated a considerable number of plants in which the occurrence of mobile starch has been hitherto questionable. In all cases when the parts were geotropically sensitive (he examined many species and various parts) he found starch-bearing cells which may be considered statocysts in HABERLANDT'S sense. A special study, also, was made of both stems and rhizoids of Chara. His results strengthen HABERLANDT'S view that the *Glanzkörper* at the apex of the rhizoids act as statoliths, but he could find no such bodies in the shoots. He leaves unsettled the question as to whether the oil drops in the sporangium of *Phycomyces nitens* act as inverse statocysts.—C. R. B.

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[6] ARNOLDI, W., Beiträge zur Morphologie der Gymnospermen. VI. Ueber den Bau der Zellkerne im Embryo von *Ginkgo biloba*. VII. Die Embryobildung bei *Ginkgo biloba*. Ann. Inst. Agronomique et Forestière à Nowo-Alexandria **16**: 1–22. 1903.

[7] LAURENT, MARCELLIN, Recherches sur le développement des Joncées. Ann. Sci. Nat. Bot. VIII. **19**: 97–192. *pls.* 1–8. 1904.

[8] SCHRÖDER, H., Zur Statolithentheorie des Geotropismus Beihefte Bot. Centralbl. **16**: 269–288. *pl.* 13. 1904.

GUILLIERMOND[9] has published a second paper upon nuclear and cell division in the ascus, extending his observations to *Pustularia vesiculosa*, *Peziza cotinus*, *Ascobolus marginatus*, and *Peziza rutilans*. For the first three he finds that the nuclear figures agree with what he and others have already described for other forms. *P. rutilans* possesses unusually large nuclei and differs from other forms so far studied in that the nuclear membrane disappears during mitosis; neither centrosomes nor asters are in evidence. In contradiction to DANGEARD'S generalization that the Ascomycetes have four chromosomes, GUILLIERMOND finds eight in *Aleuria cerea*, *P. vesiculosa*, and probably also in *Otidea onotica;* twelve in *P. cotinus*, and sixteen in *P. rutilans*.—W. G. MARQUETTE.

MOTTIER[10] has studied the development of the sperm in *Chara fragilis*, his account differing in certain important details from that of Belajeff. The blepharoplast is crescentic in cross-section, being concave within, and is of homogeneous structure, excepting a strip of granular substance along the concave side at the posterior end. It arises as a delicate thread-like differentiation of the cytoplasm at the surface of the cell, seeming to be a modification of the plasma-membrane, and in its later stages is one piece, extending the entire length of the sperm. The cilia were always found attached some distance back of the anterior extremity of the blepharoplast, and did not seem to develop from any centrosome-like body or "Plasmahöcker," as described by BELAJEFF, STRASBURGER, and others.—J. M. C.

PARTHENOGENESIS in *Taraxacum officinale* was reported about a year ago by RAUNKIAER,[11] but the evidence was hardly convincing. In a short preliminary announcement JUEL[12] describes the tetrad formation in the ovule. The embryo sac mother-cell divides, giving rise to two cells of unequal size. The smaller cell, which is nearer the micropyle, disorganizes without further division, while the larger cell develops at once into an apparently normal embryo sac. Although the number of chromosomes was not determined definitely, there seems to be no reduction, between 20 and 30 chromosomes appearing in both the embryo sac mother-cell and in vegetative cells. The mitosis in the embryo sac mother-cell is not heterotypic, although in some phases it resembles this form.—CHARLES J. CHAMBERLAIN.

PARTHENOGENESIS in *Thalictrum purpurascens* was described by OVERTON in 1902.[13] A preliminary announcement[14] of his further studies shows that the

[9] GUILLIERMOND, M. A., Recherches sur la karyokinese chez les Ascomycetes. Rev. Gén. Bot. **16**: 129–000. 1904.

[10] MOTTIER, D. M., The development of the spermatozoid in Chara. Annals of Botany **18**:245–254. *pl. 17*. 1904.

[11] See BOT. GAZ. **36**: 397. 1903.

[12] JUEL, H. O., Die Tetradenteilung in der Samenanlage von Taraxacum. Arkiv Bot. K. Svenska Vetensk. Akad. **2**:— (reprint pp. 9). 1904.

[13] BOT. GAZ. **33**:363–375. 1902.

[14] OVERTON, J. B., Ueber Parthenogenesis bei *Thalictrum purpurascens*. (Vorläufige Mitteilung.) Ber. Deutsch. Bot. Gesells. **22**: 274–283. *pl. 15*. 1904.

formation of the pollen is normal, a reduction in the number of chromosomes taking place in the pollen mother-cells. In the formation of the megaspore in some cases a tetrad of four megaspores is formed, accompanied by a reduction in the number of chromosomes. In other cases no reduction takes place in the megaspore mother-cells, and sometimes a true tetrad is not formed. Such conditions are not unexpected, since OVERTON had previously shown that while Thalictrum is often parthenogenetic fertilization may occur. The number of chromosomes in the sporophyte is twenty-four and in the gametophyte twelve. —CHARLES J. CHAMBERLAIN.

PARTHENOGENESIS in *Gnetum Ula* Brogn. is reported by LOTSY.[15] In the development of the female gametophyte, as in *G. Gnemon*, a period of free nuclear division is followed by a period of cell formation. The cells of the lower part of the gametophyte are small and form a close tissue, while in the upper part they are much larger and are loosely associated. No pollen tubes were observed, but many of the loose cells in the upper part of the gametophyte behaved like zygotes, sending out tubes as described for other species of Gnetum. The number of cells behaving in this way was so large that the pollen tubes could scarcely have been overlooked had they been present. This study has strengthened LOTSY in his previous view that the angiosperms have not come from the Gnetaceae.—CHARLES J. CHAMBERLAIN.

CARLETON[16] has published a series of notes giving the results of investigations and culture experiments with rusts. It is found that *Uromy es euphorbiae* can be propagated through the agency of seeds and seed pods infected with the fungus. This is the first instance of a rust propagated in this manner. A long series of experiments with the black stem rust of Agropyron and Elymus showed that this rust could be transferred to a number of hosts, including wheat, barley, *Hordeum jubatum*, *Agropyron tenerum*, *A. Richardsoni*, *Elymus canadensis;* while the orange leaf rust of the same species is sharply limited in its host plants. The fact mentioned by the writer in a former paper, that the uredo of the orange leaf rust is hardy during the winter, is again emphasized in this discussion. It is also shown that the uredo of blue grass rust is hardy.—H. HASSELBRING.

THE FACT that copper sulfate is much more toxic in its effect upon plants than upon animals is taken advantage of by MOORE and KELLERMAN[17] in a method for killing algae, etc., in reservoirs, without at the the same time rendering the water injurious for human consumption. According to the organisms to be exterminated, to the flow of the water, and other conditions, a certain amount of the poison is added to the reservoir, a device being used to insure uniform

[15] LOTSY, J. P., Parthenogenesis bei *Gnetum Ula* Brogn. Flora **92**: 397–404. *pls. 9–10.* 1903.

[16] CARLETON, M. A., Investigations of rusts. U. S. Dept. of Argic. Bur. Pl. Indus. Bull. 63. pp. 29. *pls. 2.* 1904.

[17] MOORE, G. T., and KELLERMAN, K. F., A method of destroying or preventing the growth of algae and certain pathogenic bacteria in water supplies. U. S. Dept. of Agric. Bur. Pl. Indus. Bull. 64. pp. 44. 1904.

distribution of the salt. The amount of copper salt needed will never exceed one part in a million of water, and since copper is not poisonous to human beings in doses of less than perhaps 0.02^{gm} daily, it appears that some fifty quarts of treated water might be taken daily with impunity! The paper represents what seems to the reviewer to be a most excellent piece of work.—B. E. LIVINGSTON.

ROLFS[18] has described several diseases of citrous trees and fruits due to *Colletotrichum gloeosporioides*. When the fungus attacks the young growing twigs, into which it gains entrance through the leaves, it produces a disease known as "wither-tip," characterized by the dying back of the young branches. The most serious damage is caused to the mature fruit into which the fungus gains entrance through an injury or bruise. The fungus rapidly develops until the whole rind is brown. This injury occurs to a large extent during the handling of the fruit, especially in the coloring process. All varieties of citrous fruits are attacked by the fungus. Spraying with potassium sulfid and copper mixtures are suggested as remedies, although no experimental data are given. Cultivation, fertilization, and pruning are also suggested as preventive measures. — H. HASSELBRING.

A RECENT CONTRIBUTION[19] from the Gray Herbarium contains six papers by the various members of the herbarium staff. The first three, by B. L. ROBINSON and J. M. GREENMAN, are "Revision of the genus Sabazia," chiefly Mexican in distribution and containing 6 species; "Revision of the Mexican and Central American species of Trixis," 16 species being presented, 6 of which are new; and "Revision of the Mexican and Central American species of Hieracium," 5 of the 19 species being new. The two papers by M. L. FERNALD are "Synopsis of the Mexican and Central American species of Alnus," one of the six species being new; and "Some new species of Mexican and Nicaraguan dicotyledons," 13 being described. A paper by J. M. GREENMAN, entitled "Diagnoses and synonymy of Mexican and Central American spermatophytes," includes descriptions of 39 new species, besides new varieties and discussions of certain critical species.—J. M. C.

HYBRIDS between Fundulus and Menedia have been investigated by MOENKHAUS.[20] The fertilized eggs begin to develop normally, but abnormalities soon appear and the embryos do not develop beyond the closure of the blastopore. Botanists will be interested in the history of the chromatin. The chromosomes of Fundulus are rather long and straight, while those of Menedia are shorter

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[18] ROLFS, P. H., Wither tip and other diseases of citrous trees and fruits caused by *Colletotrichum gloeosporioides*. Bur. Pl. Industry, Bull. 52. pp. 20. *pls.* 6. 1904.

[19] Contributions from the Gray Herbarium of Harvard University. N. S. no. XXVIII. Proc. Amer. Acad. Sci. **40**: 1–57. 1904.

[20] MOENKHAUS, W. J., The development of the hybrids between *Fundulus heteroclitus* and *Menedia notata* with especial reference to the behavior of the maternal and paternal chromatin. Amer. Jour. Anat. **3**: 29–65. *pls.* 1–4. 1904.

and are usually curved; consequently it is possible to distinguish the paternal and maternal chromosomes during fertilization and during mitosis. At the first two mitoses in the fertilized egg the two chromatins appear grouped and bilaterally arranged on the spindle, but later the grouping disappears. There is a mingling of chromatin in the resting nuclei, but the characteristic chromosomes of the two parents can be distinguished during mitosis. The writer strongly supports the theory that the chromosome is a permanent organ of the cell.—CHARLES J. CHAMBERLAIN.

THE THEORY of the individuality of the chromosome is supported in a recent paper by ROSENBERG,[21] whose work on Drosera has already furnished considerable evidence in favor of this view. In the resting nuclei of Capsella, particularly in the nuclei of the cells of the suspensor, the 32 chromosomes characteristic of the species can be counted without difficulty. The same number was counted in the sporophytic mitoses, and 16 were counted in the pollen mother-cells and in the embryo sac. Further, 48 were found in mitosis in the endosperm. Mitoses in Zostera show 6 chromosomes in pollen mother-cells and 12 in root tips. Resting nuclei in the seed coat showed 12 chromosomes. Resting nuclei in the integument of Calendula showed about 30 chromosomes, while mitoses showed 32 in the sporophyte and 16 in the gametophyte. The forms mentioned have short thick chromosomes, which are more easily traced into the resting condition of the nucleus than are the long filamentous chromosomes of the Fritillaria type. —CHARLES J. CHAMBERLAIN.

LEAVITT[22] has published the results of an extensive study of root hairs. Two types are recognized. In one case any cell of the piliferous layer in the young fixed tissue may produce a hair, there being no specialization for this purpose. This type is characteristic of most Filices, of some monocotyledons, and of the dicotyledons. In the other case special cells for producing hairs are cut off in the very young piliferous layer by a peculiarly oriented cell-division. These specialized cells the author calls "trichoblasts," and they are characteristic of all pteridophytes except most Filices, of most monocotyledons, and of the Nymphaeaceae among the dicotyledons. Attention is also called to the relationship in origin, form, and probable function between the trichoblasts and the so-called "transfusion cells" of the hypodermal layer, the short roundish or oval cells that alternate in each longitudinal row with the elongated prismatic ones. It is singular that among other references to literature the author has not included his own paper[23] of two years ago, in which the trichoblasts of Azolla were fully described. —J. M. C.

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[21] ROSENBERG, O., Ueber die Individualität der Chromosomen im Pflanzenreich, Flora **93**: 251–259. *figs.* 7. 1904.

[22] LEAVITT, R. G., Trichomes of the root in vascular cryptogams and angiosperms. Proc. Boston Soc. Nat. Hist. **31**:273–313. *pls. 16–19.* 1904.

[23] The root hairs, cap, and sheath of Azolla. BOT. GAZ. **34**:414–419. *pl. 16.* 1902.

THE FORMATION of the heterotypic chromosome is described in a recent article by BERGHS.[24] Although referring often to a "longitudinal division" of the spirem, the writer wishes it understood that he means merely the appearance throughout the length of the spirem of two filaments more or less parallel. Whether the two filaments result from the splitting of a single filament or whether there is simply the reappearance of two distinct filaments will be discussed in a future paper. The split which appears in the spirem is the one which separates the two filaments entangled in the strepsinema stage. The spirem passes into the strepsinema stage by a longitudinal fission, not by looping and approximation, as DIXON claims. After the strepsinema stage, the chromosomes are completed by a thickening and shortening. The two pieces, which the heterotypic mitosis separates, are the two longitudinal pieces of the spirem thread. If there is an approximation, it must be looked for during the formation of the spirem. This latter point will be discussed in a forthcoming paper.—CHARLES J. CHAMBERLAIN.

ROSENBERG,[25] in continuing his studies upon *Drosera rotundifolia*, describes the two mitoses in the pollen mother-cells and arrives at some interesting conclusions. In an early prophase of the first division, before the disappearance of the nuclear membrane, the chromosomes appear in pairs, which soon unite to form double chromosomes. There are 20 such double chromosomes, and they are formed by the uniting of the 40 chromosomes of the vegetative mitoses. In a series of diagrams the paternal and maternal chromosomes are represented first as distinct, and soon after as approximated in pairs. Each paternal and maternal chromosome now divides, and all of the paternal chromosomes pass to one pole and all of the maternal to the other pole. The second mitosis simply separates the two parts of each chromosome, which was already formed during the prophase of the first division, so that in two of the four pollen grains all of the chromosomes are paternal and in the other two, all are maternal. The suggestion is made that the double thread of the early spirem is due to fusion rather than to splitting, and is consequently a process of reduction.—CHARLES J. CHAMBERLAIN.

TWO PAPERS from the University of St. Petersburg bear upon the rôle of enzymes in respiration. Both are based upon quantitative work.

KOSTYTSCHEW[26] experimented with *Mucor stolonifer* and *Aspergillus niger*.

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[24] BERGHS, JULES, La formation des chromosomes heterotypiques dans la chromosome végétale. I. Depuis le spirème jusqu'aux chromosomes mûrs dans la microsporogénèse d' *Allium fistulosum* et de *Lilium lancifolium* (*speciosum*). Le Cellule **21**: 173–189. *fig. 15.* 1904.

[25] ROSENBERG, O., Ueber die Reduktionsteilung im Drosera. Meddel. Stockholms Högs. Bot. Inst. pp. 13. *figs. 20.* (Reprint signed April 1904, but the volume and date of the publication in which the article appeared are not indicated.)

[26] KOSTYTSCHEW, S., Über Atmungsenzyme der Schimmelpilze. Ber. Deutsch. Bot. Gesells. **22**: 207–215. 1904.

His most important conclusions are that both the absorption of oxygen and the excretion of carbon dioxid in the respiratory process are at least partially effected by the activity of specific enzymes; and that the excretion of carbon dioxid when free oxygen is excluded is occasioned by the activity of an enzyme which is not identical with the zymase of BUCHNER.

MAXIMOW[27] studied the behavior of the liquor expressed from the mycelium of *Aspergillus niger*, and obtained the important result that this liquor on standing exhibits a gas metabolism analogous to respiration. This exchange of gases occurs as a consequence of the activity of enzymes present in the liquor. The excretion of carbon dioxid is accomplished by an enzyme analogous to zymase, while the absorption of oxygen is induced by one of the oxydases. The former enzyme analogous to zymase also resembles zymase in being equally active in air or in hydrogen.—R. H. POND.

SABLINE[28] subjected roots of *Vicia Faba* to different temperatures; to lack of oxygen; to the action of saccharose, distilled water, sulfuric ether, quinin sulfate, and lithium chlorid, in order to determine the effect of various conditions on karyokinesis. Few divisions were found in roots subjected to 0° C. The linin was coarse-meshed and the chromatin stained blue. At 10° growth was slow and chromosomes blue. At 30°, the optimum temperature, the nucleoli did not wholly disappear in some instances, and the chromosomes stained blue; when the nucleoli disappeared the chromosomes stained red. After deprivation of oxygen chromosomes stained red. When subjected to saccharose the chromosomes were very large and stained red, and nucleoli were enormous. There were no mitoses in cells placed in distilled water. Amitosis was frequent in nuclei subjected to the action of sulfuric ether. In nuclei which divided mitotically the chromosomes were frequently scattered, and in some cells stained red, in others blue. Amitotic division was sometimes found in cells acted on by quinine sulfate. Multipolar spindles were frequent. Lithium chlorid caused the chromosomes to become abnormally large and the stain was red.—W. J. G. LAND.

A PAPER from Pfeffer's laboratory by WIEDERSHEIM[29] contributes new data to the physiology of photonastic and thermonastic movements. The opinion of JOST and SCHWENDENER that only the primary movement in response is a direct result of external stimulation, while the secondary movement constituting a correction of the primary movement is autotropic, is not supported. The view of PFEFFER that the secondary movement is not autotropic but is directly induced by the same stimulus which causes the primary movement, is strongly supported. The prophecy of FITTING that the "double curve" expressing the twice accel-

[27] MAXIMOW, N. A., Zur Frage über die Atmung. (Vorläufige Mitteilung). Ber Deutsch. Bot. Gesells. **22**: 225–235. *fig. 1.* 1904.

[28] SABLINE, V., L'influence des agents externes sur la division des noyaux dans les racines de *Vicia Faba*. Rev. Gén. Bot. **15**:481–497. *pls. 15, 16.* 1903.

[29] WIEDERSHEIM, W., Studien über photonastische und thermonastische Bewegungen. Jahrb. Wiss. Bot. **40**:230–278. *figs. 20.* 1904.

erated growth of the "middle zone" which was found by him to characterize the haptotropic movements of tendrils could also be demonstrated for photonastic and thermonastic movements is entirely fulfilled. FISCHER'S assignment of *Impatiens parviflora* to the group of autonyctitropic plants is ratified. The plants best suited for investigation of photonastic movements were found to be *Impatiens parviflora*, *I. glanduligera*, and *Chenopodium album;* while *Tulipa Duc van Toll* and *Crocus luteus* are excellent for study of thermonastic movements. The conclusions are based upon data obtained by the quantitative methods which characterize the laboratory in which the investigation was made.—RAYMOND H. POND.

A SUGGESTION as to the formation of asparagin is advanced by PRIANISCHNIKOW[30] in a preliminary paper. He argues that as the decomposition of proteids tends to produce ammonia on the one hand, and amidoacids (perhaps even aspartic acid) on the other, asparagin may be produced by the formation of ammonium aspartate from which a molecule of water separates. This secondary origin of asparagin rather than its origination as a direct decomposition product of proteids he infers from the following facts.

He and others have found that the relative amounts of asparagin and aspartic acid produced in germination and by hydrolysis of proteids are quite unlike, and they are the more unlike the later the stage of germination. In late stages the rate of asparagin production even surpasses that of proteid decomposition. Further it has been found that the decomposition of proteids by proteolytic enzymes (such as occur in the germinating seeds) gives rise to the same amidoacids and bases as hydrolysis with mineral acids, but no asparagin is formed. Finally, the distribution of asparagin in the cotyledons and growing regions is not such as would occur were it produced for migration out of the stored proteids in the cotyledons, since it is much more abundant in the growing parts than in the cotyledons.—C. R. B.

GATIN[31] has been investigating the development of the first root in the germination of *Archontophoenix Alexandrae* and *Phoenix canariensis*. The first mentioned follows the "admotiva" mode of germination in which the hypocotyl scarcely elongates. *P. canariensis* follows the "remotiva" method, the hypocotyl elongating for the supposed purpose of burying the young plant. The mature embryo of *A. Alexandrae* possesses a root of which a rudimentary vascular axis only is present. The cortex arises during germination from a zone surrounding the tip of this axis and forming apparently an integral part of the cotyledonary tissue. The region lying directly in the path of growth of the vascular axis is distinguishable into three parts. The innermost, lying directly in contact with the end of the axis, forms the root-cap. The next, together with the adjacent

[30] PRIANISCHNIKOW, D., Zur Frage der Asparaginbildung. (Vorläufige Mitteilung.) Ber. Deutsch. Bot. Gesells. **22**: 35–43. 1904.

[31] GATIN, C. L., Observations sur la germination et la formation de la première racine de quelques palmiers. Rev. Gén. Bot. **16**: 177–187. *figs.* 7. 1904.

epidermis, which forms the outermost, enters into the formation of a root sheath. The first root forms an angle of about 90° with the axis of the shoot. A subsequently formed adventitious root, which continues the shoot axis, exceeds the primary in growth and becomes the principal root at least for a time. The origin of cortex, cap, and sheath in *P. canariensis* is the same as in *A. Alexandrae*, but the axis of the primary root coincides with that of the shoot, so that the first root remains the principal one.—F. H. BILLINGS.

GERASSIMOW[32] has investigated the influence of the nucleus on the growth of the cell. By exposing various species of Spirogyra with cells in the process of division for one-half an hour to one hour to a temperature a little above 0° C., he was able so to interfere with the processes of mitosis that the following irregularities arose when the filaments were transferred and cultivated under normal conditions: cells with a single large nucleus, the equivalent of two normal nuclei; cells with the daughter nuclei fused to a greater or less extent, giving one the impression of amitosis; cells in which the daughter nuclei are normally formed but lie close to one another and both on the same side of the newly formed cell wall. This wall is either complete, thus cutting off a cell without a nucleus, or a small opening remains forming a non-nucleate chamber communicating with a binucleate cell. From a large number of measurements made upon cells as above described the author draws the following conclusions: the growth of the cells having an excess of nuclear material is greater than the average growth of normal cells; the non-nucleate cells are short-lived and the growth is very slight; the non-nucleate chambers are longer-lived and grow more than the non-nucleate cells; the cells having an excess of nuclear material may conjugate either with normal cells or with cells similar to themselves.—C. F. HOTTES.

ZIMMERMANN[33] has described the most important insects and fungous enemies of the coffee plant in the Island of Java. The following are noted here for reference. A sort of stigmonose is produced by punctures of *Pentatoma plebeja*, which attacks the lower side of the leaves and young stems. The author was unable to observe any detrimental effect on the plant due to punctures on the leaves. Very young shoots, however, wither as a result of the insect punctures. The histological characteristics of the punctures are described in detail. Of the fungi described, the well-known *Hemileia vastatrix*, occurring everywhere on the island each season, causes the greatest loss. This rust fungus is often accompanied by other parasites, as *Gloeosporium coffeanum* Del., *Coniothyrium coffeae* Zimm., *Colletotrichum incarnatum* Zimm., and *Cercospora coffeicola* Berk. & Cooke. *Capnodium javanicum*, *Rhombostilbella rosea*, and *Antennaria setosa* are described as new species growing on the surface of the leaves in secretions of *Lecanium viride* and other insects. A fungus whose systematic position is not

[32] GERASSIMOW, J. J., Zur Physiologie der Zelle. Bull. Soc. Imp. Nat. Moscow. no. 1, pp. 134. *pl. 1.* tables 60. 1904.

[33] ZIMMERMANN, A., Einige pathologische en physiologische Waarnemingen over Koffie. Mededel. 's Lands Plantentuin, no. 67. pp. 105. *pls. 4.* 1904.

certain causes an injury termed "spiderweb disease." A number of other fungi, many of them new, are described on the stems, roots, and fruit of the plant. Those on the fruit are mostly saprophytic molds. The last part of the report contains some observations on sterility of coffee flowers, variation in the fruit, polyembryony and the influence of light, and injuries due to nematodes.—H. HASSELBRING.

THE INFLUENCE of chloral hydrate upon nuclear and cell division is described in a recent paper by NĚMEC.[34] It is possible that very weak solutions may stimulate division, but more concentrated solutions cause various disturbances. Some stages in mitosis are more readily and more profoundly influenced than others. The phragmoplast is most resistant. The stages of metakinesis are much less resistant, and the equatorial plate stages and stages in the formation of the spindle are the most sensitive of all. Root tips which have been treated for an hour in 0.75 per cent. chloral hydrate show a degeneration of the spindle fibers and an interruption of mitosis. If the solution be washed out and normal conditions restored, mitosis proceeds in the usual manner, but the interrupted mitoses give rise to cells with several nuclei, or an irregular nucleus and incomplete walls may be formed. In binucleate cells the nuclei may fuse, and the nucleus resulting from such a fusion has double the usual number of chromosomes. In cells in which the two nuclei do not fuse, two mitoses may occur simultaneously. Cells without nuclei may be formed. Mitoses with double the number of chromosomes gradually disappear from the root tip and apparently a reduction in the number of chromosomes takes place. There was no conclusive evidence that chloral hydrate causes amitosis. Figures which might be mistaken for amitosis were abundant, but they could be interpreted as interrupted or modified mitoses. —CHARLES J. CHAMBERLAIN.

NON-SEXUAL NUCLEAR FUSIONS is the title of a series of short papers by NEMEC.[35] Much of the material was obtained by treating root tips of seedlings of *Pisum sativum* with a 0.75 per cent. solution of chloral hydrate. Tips 3 to 3.5^{cm} long were placed about 2^{cm} deep in the solution and allowed to remain for an hour. They were then washed in water, material being fixed at intervals. Material fixed immediately after removal from the chloral solution shows numerous binucleate cells besides other abnormalities. After an hour's washing in water normal mitosis and abnormalities become less numerous, and after about twenty-eight hours' washing the processes are practically normal. The nuclei of the binucleate cells fuse and some stages in the fusion might be mistaken for amitosis. No amitosis, however, was observed. When a nucleus which has resulted from fusion divides, it shows double the number of chromosomes characteristic of the sporophytic cells. NĚMEC believes that the double number is not maintained

[34] NĚMEC, B., Ueber die Einwirkung des Chloralhydrats auf die Kern und Zellteilung. Jarhb. Wiss. Bot. **39**: 645–730. *figs. 157*. 1904.

[35] NĚMEC, B., Ueber ungeschlechtliche Kernverschmelzungen. Sitz. Ber. Königl. Böhm. Gesells. Wiss. I, 1902; II, July 1903; III, Nov. 1903.

but soon becomes reduced. The fusions resemble sexual fusions in the behavior of the chromatin. The nuclear fusion and the reduction may be regarded as automatically regulated phenomena. Reduction may sometimes be an atavistic character; it is a result of fusion rather than a preparation for it. Morphologically the most important character of fertilization lies not in nuclear fusion but in cell fusion. When the conditions for cell fusion are present the other phenomena (under certain conditions) follow necessarily as automatically regulated processes.—CHARLES J. CHAMBERLAIN.

THE EXTANT theories of causality in leaf arrangement have been critically discussed in detail by WINKLER[36] in two parts of a paper on this subject, of which we are promised a continuation in a third part. The author brings forward evidence from various plants that the mechanical theory of SCHWENDENER will not suffice to explain the formation and development of primordia. There appear to be many cases in which the primordia are not constant in size at the start, many in which contact or absence of contact between different primordia plays no controlling rôle in development, and also many in which pressure of older parts has no influence. The various theories of teleological nature, such as the common one which attributes leaf arrangement to the need of having these organs so placed as to give best access of air and light, are discussed rather more fully than would seem necessary for intelligent readers. It is to be hoped that such theories may at length be accorded a decent burial and then allowed to rest.

The constructive part of this paper points out that any theory of leaf arrangement which is satisfactory must consider internal factors together with the external ones. WINKLER is careful to indicate that by this term he refers merely to those protoplasmic conditions (probably purely physical) of which we know absolutely nothing at present except that they exist. The general conclusion of the paper may be summed up in a paraphrase of the author's words, that the formation of organs at the growing tip is an extraordinarily complex process controlled by a whole series of factors of different kinds, concerning the nature and influence of which we know practically nothing.—B. E. LIVINGSTON.

SWINGLE[37] has just published the results of his study of the date palm, and they are important not only in demonstrating the possibilities of a valuable crop for the United States in regions otherwise apparently hopeless from an agricultural point of view, but also from their much larger practical bearing upon the value of such investigations. The following statement is vigorous, but who will dispute it? "At present it is no exaggeration to state that the life history requirements and the limits of the power to resist unfavorable environmental conditions are far better known for many microscopic lower plants, such as bacteria, fungi, and algae, even for species having no economic importance, than for the most

[36] WINKLER, H., Untersuchungen zur Theorie der Blattstellungen. I. Jahrb. Wiss. Bot. **36** : 1–79. *pls. 4.* 1901; II, *ibid.* 501–544. *pl. 1.* 1903.

[37] SWINGLE, W. T., The date palm and its utilization in the southwestern states, pp. 155. *pls. 22.* Bur. Pl. Industry, U. S. Dept. Agric., Bulletin 53., April 28. 1904.

important crop plants whose culture provides employment for tens of millions, and whose products constitute the daily food of hundreds of millions of human beings. Such a condition is discreditable alike to biological and to agricultural science and should not longer continue."

In reference to the date palm the following conclusions are reached: It can endure any degree of heat and any amount of dryness in the air, and is even favored by hot winds and by a rainless summer. The best sorts can mature only in regions having a very long and very hot growing season. It can endure more alkali in the soil than any other profitable crop plant, and can thrive on soils containing from 0.5 to 1 per cent. of alkali, even when irrigated with brackish water containing 0.43 per cent. (430 parts per 100,000) or more of injurious alkali. It can withstand without injury accumulations of alkali at the surface of the soil that would kill all other crop plants, even those considered to be very resistant to alkali.—J. M. C.

PORSILD[38] gives an account of the expedition to Disko Island in 1898. The account includes observations on the geology and topography of the island, incidental notes on the fauna, and detailed notes on the flora. In conclusion he discusses the southern flora of the island, considering the questions of possible relict endemism from a warmer epoch, and migration in postglacial times.

The upland vegetation consists of lichens and herbaceous plants with very few shrubs. Under this category are placed the windy plateaus, the sheltered terraces of the trap, the gravelly bottoms and deltas, and the raised sea bottoms. The Calluna heath is found on the talus and gradual slopes of the trap, on large hills poor in humus, or in depressions rich in water. The tundra is discussed as a peculiar formation transitional between the moss-bog and the Calluna heath, the transition to one or the other depending upon the water content of the soil. Moss bogs are found where water stagnates and is sour, on gneiss, on uneven basalt, and on undrained terraces, where the bog often goes above the Calluna. In some cases the moss formation actually forms the climax type after the Calluna, and in comparison is relatively unmixed in its species.

Halophytes occur along the sea strand. Cyperaceous meadows occur only along streams in very flat and moist soil. Dwarf birches and willows are also found along streams, the former occurring on a somewhat drier soil than the latter.

As regards vegetation in the inland waters, lakes are poor in species, but rich in individuals. Glacial streams contain no vegetation or at most only a few diatoms. Other streams, especially the warm ones, are rich in algae, especially *Hydrurus foetidus*. The floristic difference on gneiss and basalt is not marked when flowering plants are considered. Mosses, on the other hand, decidedly prefer the one or the other. Thus species of *Andreaea*, *Sphagnum*, and *Sarcos-*

[38] PORSILD, M. P., Bidrag til en Skildring af Vegetationen paa Öen Disko tilligemed spredte topografiske og zoologiske Iagttagelser. Meddel. om Grönland **25**: 91–308. *pls. 1–6.* 1902.

cyphus never occur on basalt or tuff, while *Drepanium*, *Thuidium abietinum*, *Brachythecium salebrosum*, and *Pottia latifolia* are characteristic basalt plants. —G. H. JENSEN.

IN A RATHER lengthy paper on embryonal substance, NOLL[39] discusses the various theories which have been announced regarding the controlling force in development, and presents some interesting observations on the protoplasm of the growing tip in Bryopsis, together with his interpretation of the latter. The facts, determined by very careful observation of the growing tips, are as follows: The protoplasmic circulation of the filament occurs throughout the whole plant, extending into the tip region as well as elsewhere; nevertheless the protoplasm of the apical portion is very different from that below. While the non-growing portions have only the usual thin protoplasmic layer lining the wall, that of the growing tip occupies the whole lumen. Also in the tip there are no chloroplasts, and the protoplasm is much more dense than elsewhere, while the nuclei are more numerous. Since the currents of cyclosis are constantly carrying new substance into the tip and out again, there is a constant transformation of protoplasm at the limit of the denser region from somatic to meristematic and *vice versa*. At this limit the entering substance becomes more dense and the chloroplasts are left behind in apparently somewhat the same way as lighter bodies float upon water. NOLL suggests that the increase in density may be due to loss of water from the entering protoplasm. (It occurs to the reviewer that it may be due to incipient coagulation of the colloidal bodies.)

On account of this constant interchange between apical and more basal portions, it is impossible to suppose here that the meristematic protoplasm in the former region is fundamentally different from the somatic. The author concludes that, since the *Hautschicht* is the only part of the living substance which is constantly at the tip, and does not take part in the cyclosis, it must be in this that the controlling factor of growth is located. Thus he looks upon the *Hautschicht* of the tip as the only true embryonal substance here, and it does not contain nuclei. Therefore, he points out that in Bryopsis the factor producing growth does not lie in nuclei. The objection to this conclusion lies in the fact that we cannot be sure that some form of cyclosis does not occur in the *Hautschicht;* that it is not observed does not prove its absence.—B. E. LIVINGSTON.

SPERMATOGENESIS in *Marchantia polymorpha* has been reinvestigated by IKENO.[40] In many points this investigation has confirmed the earlier work of STRASBURGER and SCHOTTLÄNDER, but the more critical methods have made it possible to bring out important features which have hitherto been overlooked. During the early divisions in the young antheridium no nucleolus is demonstrated; the number of chromosomes is eight, as SCHOTTLÄNDER has already shown.

[39] NOLL, F., Beobachtungen und Betrachtungen über embryonale Substanz. Biol. Centralbl. **23**: 281–297, 321–337, 401–427. 1903.

[40] IKENO, S., Die Spermatogenesis von *Marchantia polymorpha*. Beih. Bot. Centralbl. **15**:65–88. *pl. 3*. 1903.

SCHOTTLÄNDER'S statement that centrosomes are present during the diaster and dispirem stages in young antheridia is also confirmed. Centrosomes were found throughout the spermatogenous divisions, during which they perform the ordinary functions of centrosomes. They do not persist throughout the life history of the cell, but appear at the beginning of each mitosis and disappear by the time the dispirem stage is reached. After the spermatogenous divisions have ceased, the centrosome reappears, functioning not as a centrosome but as a blepharoplast giving rise to the cilia. IKENO interprets as genuine centrosomes the blepharoplasts of various pteridophytes and of the cycads and Ginkgo.

According to current accounts, the spermatogenous tissue, at the close of the spermatogenous divisions, consists of approximately cubical sperm mother-cells, each of which gives rise to a single spermatozoid. The present investigation shows that there is still another nuclear division in a diagonal plane and not followed by the formation of a cell wall, so that each sperm mother-cell gives rise to two spermatozoids. This is true not only for Marchantia, but probably for other liverworts also. At this diagonal division, the centrosomes, after functioning as centrosomes, do not disappear, but persist and function as blepharoplasts. The blepharoplast elongates, and its body comes into close contact with the inner surface of the spermatid cell, so that it appears like a thickening of the *Hautschicht*. From this elongated centrosome, or blepharoplast, come the two cilia.

Shortly after the diagonal division a peculiar spherical body, staining somewhat like the centrosome, appears in each spermatid mother-cell, but is readily distinguished from the centrosome by its larger size and its position. It is still distinguishable after the centrosome has given rise to the cilia. From the resemblance to the chromatoid body of some animals, the same name is suggested for this body. Occasionally each of the cells resulting from the diagonal division divides. Such a division is accompanied by a division of the chromatoid body and of the centrosome. Thus four spermatozoids would be formed from what is usually denominated a sperm mother-cell. However, only two spermatozoids mature, the supernumerary ones being used for nutrition. This homology of the centrosome is fully discussed.—C. J. CHAMBERLAIN.

PROBLEMS CONCERNING WATER ABSORPTION by epiphytic Bromeliaceae have been investigated by MEZ,[41] who has gone carefully over the ground traversed a few years ago by SCHIMPER. He agrees with SCHIMPER in most particulars, but is at variance with him regarding the behavior of the individual scale during water absorption. SCHIMPER claimed that the four central and empty cells of the shield part of the scale are filled with air when the surface of the plant is dry, and that the air is replaced by water when the surface is wet. MEZ by microchemical tests, as well as by direct observation, finds that the cavities of

[41] MEZ, CARL, Physiologische Bromliaceen-Studien. I. Die Wasser-Oekonomie der extrematmosphærischen Tillandsien. Jahrb. Wiss. Bot. **40**: 157–229. *figs. 26.* 1904.

the four cells are always free from air, so that when dry conditions prevail they are in a state of complete collapse. The much thickened upper surface of the shield part, or *Deckel*, is the active part concerned in absorption of water from the capillary spaces beneath the scale. It is composed of a mesh of cellulose containing large deposits of pectin. A layer of pure cellulose covers all. When wet, this *Deckel* absorbs water rapidly, and being resisted beneath by the epidermis, as well as on the sides by the cellulose wing of the scale, the only direction in which swelling can take place is upwards. As a consequence, the *Deckel* becomes convex, the cone-like processes on its under side straighten out and become more obtuse, with the result that the collapsed walls of the four cells separate, causing cavities into which water is drawn through thin areas in their outer walls, in response to the negative pressure. Water is thus absorbed till the scale is distended to its greatest extent, and the four central cells are filled with water. MEZ has calculated the amount thus drawn into one scale in *Tillandsia streptocarpa*, and found it to be approximately $0.000464^{\text{cu mm}}$ or 1.451^{cc} for a given entire plant having 1,880,000 scales. The shield, or central region of the scale, lies in connection with a row of 1–4 living cells, which in part form the stalk of the scale. The uppermost of these is larger than the others and borders directly on the four water-filled cells. The transverse walls of this cell are cuticularized except in certain small areas. The water contained in the four cells adjacent above is drawn through these areas into the cell by osmotic action due to the presence of sugar in the cell sap.

The water is passed on through the series of stalk cells, whose cross walls have uncuticularized areas, till the mesophyll is reached. This continues till the water in the capillary spaces outside is exhausted, or until the plant is supplied. The water remaining in the four central shield cells is not available to the plant, as the tension of the scale overbalances the absorptive power due to osmosis. This water must pass off by evaporation from the surface of the scale. It will be seen that the scale acts like a suction pump in drawing water into the cells, whence it may be absorbed into the plant by the usual process of osmosis.—F. H. BILLINGS.

ITEMS OF TAXONOMIC INTEREST are as follows: H. and P. SYDOW (Ann. Mycol. **2**:162–174. 1904), among descriptions of many new species of fungi, establish *Microcyclus*, *Phaeodothis*, and *Maurodothis* as new genera of Dothideaceae.—E. L. GREENE (Ottawa Nat. **18**:37–39. 1904) in a second paper on Canadian Antennarias describes five new species.—T. S. BRANDEGEE (Zoe **5**:179–182. 1904) has described new Mexican species of Thelypodium (2), Spermacoce, Gentiana, Gilia, Castilleia, and Krynitzkia.—J. M. GREENMAN (*ibid.* 183–187) has described new species of Cerastium (3), Arenaria, Dalea, Nama, and Eupatorium (2) from Mexico.—KATHARINE BRANDEGEE (*ibid.* 189–194), among other critical notes on Cactaceae, has described new species of Cereus (4) and Mammillaria (2).—L. DIELS and E. PRITZEL (Engler's Bot. Jahrb. **35**:55–160. 1904), under the title "Fragmenta Phytographiae Australiae occidentalis," present

a list of the plants through Proteaceae, with critical notes, including descriptions of new species and the following new genera: *Dielsia* Gilg (Restionaceae) and *Hydatella* Diels (Centrolepidaceae).—KENNETH K. MACKENZIE (Torreya **4**:56–57. 1904) has described a new species of Œnothera from West Virginia.—D. R. SUMSTINE (*ibid.* 59) has described a new species of Hydnum from Pennsylvania.—CHARLES H. PECK (Bull. Torr. Bot. Club **31**:177–182. 1904) has published 16 new species of fleshy fungi.—A .W. EVANS (*ibid.* 183–226. *pls. 8–12.* 1904), in his fourth paper on the Hepaticae of Puerto Rico, has described *Cyclolejeunea* as a new genus containing four species.—H. CHRIST (Bull. Herb. Boiss. II. **4**:393–400. *pl. 1.* 1904) has described a new genus (*Loxsomopsis*) of Filicales (Loxsomaceae) from Costa Rica.—G. LINDAU (*ibid.* 401–418), in his third and closing paper on American Acanthaceae, has described *Juruasia* as a new genus.—K. GIESENHAGEN (Ber. Deutsch. Bot. Gesells. **22**:191–196. *pl. 13.* 1904) has described a new genus (*Sorica*) of Ascomycetes found attacking the sori of ferns.—F. HEYDRICH (*ibid.* 196–199) has described a new genus (*Stereophyllum*) of Corallinaceae. AVEN NELSON (Bull. Torr. Bot. Club **31**: 239–247. 1904) has separated a new genus (*Chondrophylla*) from Gentiana and described new species in Eriogonum (2), Linum, Anogra, Pachylophus, Lavauxia, Gentiana, Hedeoma, Castilleja, and Symphoricarpos.—N. L. BRITTON (Torreya **4**: 93. 1904) has described a new Scirpus from Colorado.—FR. BUBÁK (Hedwigia **43**: 195–196. 1904) has described a new genus (*Lentodiopsis*) of Agaricaceae from Bohemia.—W. R. MAXON (Proc. U. S. Nat. Mus. **27**: 741–744. 1904) has described two new species of Polypodium from Jamaica.—E. ROSENSTOCK (Hedwigia **43**: 210–238. 1904) has begun a series of papers on the pteridophytes of southern Brazil.—P. HENNINGS (*idem* 242–273. *pl. 4*), in his second paper on Ule's collection of fungi from the Amazon region, has described *Hypoxylonopsis* (Dothideaceae), *Parmulariella* and *Uleopeltis* (Hysteriaceae), and *Rehmiomyces* (Bulgariaceae) as new genera.—F. VON HÖHNEL (*idem* 295–299) has described a new genus (*Atractina*) of Hyphomycetes.—W. A. MURRILL (Bull. Torr. Bot. Club **31**: 325–348. 1904), in his seventh paper on the Polyporaceae of North America, presents Hexagona (17 spp., 8 new), Grifola (6 spp., 1 new), *Romellia* (new genus), Coltricia (6 spp., 1 new), and *Coltriciella* (new genus)—O. F. COOK (*idem* 349–355), in a discussion of the nomenclature of the royal palms, has described a new genus (*Plectis*) from Guatemala.—G. E. OSTERHOUT (*idem* 357–358) has described new species of Arabis and Aulospermum from Colorado.—H. SYDOW (Ann. Mycol. **2**: 244. 1904) has described a new genus (*Rickiella*) of Ascomycetes.—F. VON HÖHNEL (*idem* 273–275) has described the new genera *Kordyanella* (Hymenomycetes) and *Debaryella* (Hypocreaceae).—THEO. HOLM (Am. Jour. Sci. IV. **18**: 12–22. 1904), in a report upon a collection of Canadian (British Columbia) Cyperaceae, has described a new Scirpus.—J. M. C.